

DOCUMENT RESUME

ED 450 702

IR 020 583

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TITLE Assessing the Impact on Students of Online Materials in University Courses.
PUB DATE 1999-00-00
NOTE 15p.; In: EDUCAUSE '99: Celebrating New Beginnings. [Proceedings] (Long Beach, CA, October 26-29, 1999); see IR 020 580.
AVAILABLE FROM For full text:
<http://www.educause.edu/conference/e99/proceedings.html>.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; Computer Uses in Education; Data Analysis; *Educational Technology; *Evaluation Methods; Higher Education; Instructional Materials; Online Systems; Pilot Projects; Program Effectiveness; Program Evaluation; World Wide Web
IDENTIFIERS Electronic Resources; Web Based Instruction

ABSTRACT

Many universities currently encourage the use of online materials to enhance on-campus courses. Assessment of the impact of these technology-enhanced course initiatives is necessary to give insight into the best practices--those that faculty should be encouraged to use based on student need. Assessment studies of this type will enrich the literature of distributed learning in higher education. In the fall term 1998, the University of Pittsburgh (Pennsylvania) conducted a pilot project to study the instructional impact and support needs for a Web-based instructional management system. The system centered on the "CourseInfo" software package acquired from Blackboard, Inc. The pilot was the result of a nine-month campus-wide software selection process, and a four-month effort to design and develop training and support systems. This paper describes the project, explains the assessment strategies designed for the pilot, and summarizes the results of formative and summative evaluation measures. The assessment includes data collected from students and faculty members in 20 courses (22 sections) with 1,850 students. The paper includes 11 tables. (AEF)

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Assessing the Impact on Students of Online Materials in University Courses

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Many universities currently encourage the use of online materials to enhance on-campus courses. Assessment of the impact of these technology-enhanced course initiatives is necessary if we are to gain insight into the best practices—those that faculty should be encouraged to use based on student need. Assessment studies of this type will enrich the literature of distributed learning in higher education. This paper will present and discuss 1) a process for designing assessment strategies to measure the impact of online course materials on students and 2) the results of formative and summative evaluation, including the categories of benefits reported by students. Based on a campus-wide initiative to train university faculty to use course management software, this assessment includes data collected during a pilot-term with over 1850 students enrolled in 20 courses (22 sections).

Introduction

In the Fall Term 1998, the University of Pittsburgh conducted a pilot project to study the instructional impact and support needs for a Web-based instructional management system. The system centered on the *CourseInfo* software package acquired from Blackboard, Inc. The pilot was the result of a nine-month campus-wide software selection process, and a four-month effort to design and develop training and support systems.

This paper describes the project, explains the assessment strategies designed for the pilot, and summarizes the results of formative and summative evaluation measures. The assessment includes data collected from students and faculty members in 20 courses (22 sections) with 1,850 student seats.

Background

The University of Pittsburgh is a state-related public research university and a member of the Association of American Universities (AAU). Founded in 1787, Pitt offers graduate, undergraduate, professional, and continuing education programs through 19 schools and four regional campuses. The University typically serves about 28,000 FTE in the fall term, and employs nearly 4,000 full- and part-time faculty members. Pitt's regional campuses are located between 30 and 170 miles from the main campus in Oakland, Pittsburgh's cultural and medical center. Among the notable sites on the Oakland campus is the 42-story Cathedral of Learning with its 28 nationality classrooms, each representing the heritage of one of the region's many ethnic groups.

The Center for Instructional Development & Distance Education (CIDDE) works directly with schools, departments, and individual faculty members to facilitate the academic goals of the

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University in the areas of instructional development and technology, media support, faculty development, and distance education. With this broad mission of instructional development and support, CIDDE pursues new initiatives that will optimally support the academic priorities of the institution. These initiatives fall into three general categories: the acquisition or development of tools and facilities, the development and delivery of instructional support services, and the provision of assistance in the development of academic programs and instructional materials.

During the summer of 1997, the Director of CIDDE met with 20 deans to identify their instructional technology and distance education needs and priorities. Based on these discussions she identified three common needs: (1) for computer-based conferencing, (2) for a method to easily create online materials, and (3) for a consistent "look and feel" to the University's online course offerings.

Based on this identified need, a CIDDE instructional designer organized and chaired a committee to evaluate emerging software tools designed to facilitate the development and use of the World Wide Web for instruction. The committee included faculty and staff from CIDDE, the centralized computing services groups, and the University Library System, who volunteered to review existing software, and to try out selected packages to evaluate their potential utility. The committee articulated detailed requirements for a Web-based instructional package, identified the packages that addressed those needs, and ranked and rated each of the packages. The most promising five packages were selected for detailed evaluation, and trial copies were either accessed online or obtained, installed and tested by faculty in actual classes for the Spring Term 1998.

In May 1999, after nine months deliberation, the committee recommended that the University acquire the *CourseInfo* instructional management system. The recommendation was presented, approved, and funded through the Software and Networked Information Working Group of the Executive Committee for Academic Computing. The work of the Web evaluation committee is summarized in a web page at URL <http://www.pitt.edu/~washburn/css.html>.

CourseInfo is an integrated software suite that enables faculty members to develop, manage, and use Web pages for instruction. *CourseInfo* acts as a "container" for organizing the instructional components of an online course. It offers tools to administer, grade, and record quizzes, to conduct synchronous chat sessions, and to hold asynchronous threaded discussion groups. It also provides user-friendly software to facilitate the instructor's efforts to create new Web pages or incorporate existing pages, send e-mail, transfer files to and from students, and manage an online grade book. *CourseInfo* runs in both the Unix and NT Web server environments and is accessible using standard Web browsers and plug-ins.

The primary factors driving the selection of *CourseInfo* included its ease of use and its adherence to standards such as SQL and the emerging Instructional Management System metadata model (the EDUCAUSE IMS Project). *CourseInfo* was the only package previewed that enabled inexperienced faculty members to create effective materials with no knowledge of HTML, yet still allow more advanced users to leverage their knowledge of HTML and Web-based authoring tools to produce sophisticated results.

Implementation of the Pilot

Project implementation was a cooperative effort between CIDDE and the centralized computer service units (the Computer Services and System Development unit and the Network Services unit), coordinated through a series of regular planning meetings and advised by several faculty committees. This section explains some of the important factors in the project implementation plan.

The University acquired multiple licenses of the *CourseInfo* package and implemented three

servers in order to create a stable, secure and efficient environment. First, CIDDE implemented a test version of *CourseInfo* under Apache on a low-end Pentium processor running Linux. The test version was used to experiment with new releases and patches of the software. A second "development" server was implemented on a small Sun processor running Solaris and Apache. Faculty members used this server to develop their Web pages in a secure, confidential environment. The centralized Network Services group managed the third server, a high-end Sun processor also running Solaris and Apache. This "production" server was maintained seven days a week, 24 hours per day, and supported the online courses, faculty, and students.

In response to concerns raised by several faculty committees about the sufficiency of remote access to the Pitt network, the Network Services group increased the dial-in modem pool by 40% to over 800 dial-in ports. In addition, to handle the anticipated increase in student and faculty problems that might occur when implementing Web-based instruction, the Computer Services and Systems Development group expanded the existing single-shift help desk to a 7 x 24 environment. The group also took proactive steps to prevent problems by ensuring that all requisite plug-ins were available in the public student computing labs and providing in-class orientations to students at the beginning of the term.

Another potential issue was the anticipated increased desire by instructors to use computer projection technology in the classroom to demonstrate components of *CourseInfo* to their students. In response to this issue, the Classroom Management Team escalated the rate of classroom renovations to install computer projection devices in more classrooms. CIDDE's Instructional Media Services area also increased their inventory of portable microcomputers and projection units for mobile classroom presentations, and hired and trained additional student AV operators.

To increase the likelihood of the project's success, administrators in the Provost's office gave two important directives. First, they made a strong commitment to training faculty in the use of *CourseInfo*, and second, they limited the number of courses that would be offered in the pilot term. For the Fall Term 1998 (99-1) pilot, 20 faculty members developed 20 courses (22 different course sections) serving 1850 students. The goals of the pilot were to evaluate *CourseInfo* and to determine the access and support needs of implementing Web-enhanced instruction.

Summer Instructional Development Institute

Training for the pilot term was supported under the auspices of a newly proposed Summer Instructional Development Institute (SIDI). SIDI was initially conceived to provide intensive training and development opportunities for faculty over the summer. For its inaugural season, the Institute focused on training two groups of 12 faculty members in the use of *CourseInfo*. The first group was selected by the chairpersons of five science departments identified by the dean of the College of Arts and Sciences. This selection specifically targeted instructors of large, predominately freshmen courses with a goal of evaluating the effectiveness of Web-based course components in improving the experiences of students in large lecture settings (greater than 100 students per class). The second group was selected by the deans of schools and campuses that had expressed strong interest in the project. The faculty members involved were from the Faculty of Arts and Sciences (the Biology, Chemistry, Psychology, Geology, and Physics departments), the School of Education, the School of Nursing, the School of Pharmacy, the School of Health and Rehabilitative Sciences, and from the Johnstown and Bradford regional campuses.

The Institute covered basic course design topics and featured hands-on instruction related to the mechanics of using *CourseInfo* and other related software tools. The courses were designed and taught in collaboration with the centralized computing services and library groups.

After analyzing *CourseInfo* and its anticipated training needs, several key decisions were made. First, training for *CourseInfo* would be implemented using *CourseInfo*. That is, faculty members would be enrolled in a *CourseInfo* "meta course" that would (1) serve as an exemplar of desired *CourseInfo* organizational structure and concepts, (2) serve as a repository of training and reference material, and (3) provide faculty with the opportunity to gain experience with *CourseInfo* from the students' perspective.

The second decision was to focus *CourseInfo* training more on the instructional design requirements of creating a Web course than on the mechanics of using the software package. Training would therefore promote the use of a straightforward instructional design model, originally developed at Pitt's Learning Research and Development Center and later tailored to meet the needs of the University's paper-based distance education program. This approach was possible because of the relatively easy task of training instructors in the use of *CourseInfo*, due to its friendly user interface.

The final decision was to provide faculty course developers with a recommended structure in the form of a "template" course. In this approach, *CourseInfo* is viewed as a "container" of instructional materials. These materials are contained in documents and folders under appropriate subdivisions within a *CourseInfo* course site. Native *CourseInfo* ("out of the box") gives instructors a blank slate to contain any type of document in any structure or order. CIDDE instructional designers developed the "Pitt *CourseInfo* Template" to provide a more-specific structure to *CourseInfo* courses. This structure is intended to provide consistency across different courses, allowing students familiar with one *CourseInfo* section to easily adapt to a second.

The Pitt *CourseInfo* Template specifies and explains a suggested structure for the "Course Information" and "Course Documents" components of *CourseInfo*. The Course Information component is considered analogous to a course syllabus and defined to include the following sections (documents):

- Introduction
- Class Meeting Times
- Course Description
- Course Rationale
- Course Goals
- Course Outline
- Course Materials
- Course Requirements and Grading
- Course Policies
- Course Schedule

Whereas the Course Information component of *CourseInfo* contains information about the course, the Course Documents component contains the course materials themselves. The template suggests that the course materials be subdivided into manageable units of work. These units, or modules, could be associated with chapters of a text, weeks of the term, or concepts of the course. Each module would be implemented via a separate folder within the Course Document component of *CourseInfo*. Each folder is defined to include the following

documents:

- Introduction
- Learning Objectives
- Lecture Notes
- Handouts
- Exercises
- Quizzes or Sample Tests
- Related Readings

The student would complete the course by working through each module in turn until all modules were mastered.

CourseInfo training was designed around the process of implementing a Web-based course using the Pitt *CourseInfo* Template. For the Summer Institute, a five-day modular training program was developed that covered this process and addressed other related tools and issues. This five-day sequence was later divided into more discrete components. A one-day core course was a prerequisite for participation in *CourseInfo*. The core course, titled "Course Design And Development Using *CourseInfo*," addressed the following topics:

- Introduction
 - Basic Web concepts
 - *CourseInfo* from the student's perspective
- Instructional Design Model and Process
- *CourseInfo* Development
 - Content editors
 - Administration and course management
 - Testing and grade book functions

In addition to the required core training, several supplemental training modules were developed and offered to faculty. Participation in these modules was optional, based on each faculty member's goals and interests. The supplemental modules included:

- Microsoft Word and Virus Prevention Using *CourseInfo*
- Microsoft PowerPoint with *CourseInfo*
- Designing and Acquiring Images for *CourseInfo*
- Using Audio and Video with *CourseInfo*
- Copyright and Legal Issues

Upon the completion of the Summer Institute, the pilot program was launched in the Fall Term 1998. Data from subsequent terms reflect significant growth in the faculty's adoption of *CourseInfo* (See Table 1, page 7).

Formative Evaluation

Evaluation of the pilot program was a crucial component of the project plan. To create an evaluation strategy, two instructional designers and a research design consultant formed a project assessment team. The team designed assessment goals and strategies based on the need to gain feedback from both students and faculty on issues related to access, support, and the instructional value of using *CourseInfo*. The evaluation team reviewed *The Flashlight Project's* student inventory items as a basis of reference, drawing upon this pool of questions to develop an instrument to meet specific evaluation goals.

Because the primary goal of formative evaluation was to identify any serious problems that students might encounter with accessing and using *CourseInfo*, early intervention was important. Therefore, in mid-October, CIDDE staff visited a representative sample of nine of the 22 course sections using *CourseInfo* and administered one-page paper surveys to all of the students attending class. Of the nine courses included in this evaluation, several were high enrollment, introductory science courses (the focus of the first Summer Institute). The sample also included undergraduate and graduate courses, low enrollment courses, and those offered on the Pitt's main campus and regional campuses. Out of the 1850 students using *CourseInfo* during the pilot term, 485 students were surveyed for the formative evaluation.

These data indicated that most students (92%) had already accessed the *CourseInfo* pages for their courses (by the sixth week of the term), and that more than half of them (59%) had not previously used a Web-based tool. The students indicated that the initial in-class explanations they received from the University computer support area or from their instructor on how to use *CourseInfo* were adequate (95%). Suggestions for improvements included providing handouts and conducting the training sessions in computer labs. Students reported very few difficulties using *CourseInfo* (87% of students surveyed did not contact the 24-hour help desk with questions/problems), and those who did have difficulty were able to obtain the needed assistance. Data from the help desk indicated that most student questions focused on how to configure their personal computers for dial-in access or how to establish computing accounts.

One of the ten questions in the formative survey addressed the instructional value of *CourseInfo*, resulting in 69% of the students reporting that *CourseInfo* materials had helped their learning to a moderate or high degree. Additional positive student comments as to what *CourseInfo* components were helpful included "Lecture notes available online," "Checking my grades," "Assignments available online," and "Taking quizzes and practice exams." Only 4% of the students identified problems or concerns about using *CourseInfo*, specifying problems such as "access from home using a modem" and insufficient "computer lab hours."

Summative Evaluation

One of the main goals of this initiative was using instructional technology to enhance teaching and learning. Consequently, the summative evaluation focused on the instructional value of *CourseInfo*. The primary evaluation objective was to identify which components were helpful to students' learning and why.

Evaluation measures used during the pilot program included surveys, anecdotal data, help desk reports, and Web server statistics. Similar to the formative evaluation procedures, staff administered paper surveys to students in classrooms during the last two weeks of the term. Of the 1850 students enrolled in these courses, 796 surveys were returned.

The data indicated that students were accessing their course Web pages primarily through University student labs (436 responses), residence halls (125 responses), and via modem (263 responses). See Table 2, page * for Web server access statistics.

Components Identified as Helpful by Students and Why

Students were asked to identify which components were helpful (of those used in their courses) and why. A content analysis of students' open-ended responses was completed, and the following summarizes these data. It should be noted that not all *CourseInfo* components were used in every course. For example, some courses did not use group work tools at all. The number of students' open-ended comments for each item is reported in Table 3 through Table 9.

Three of the most highly used components were also the ones that students rated as most helpful: Lecture Notes, Quizzes/Practice Exams, and Course Announcements (see Table 3, Page *). Other components rated as helpful included: Assignments, External Links, and E-mail. Student responses were very low for the remaining components (Group Work, Students Drop Box, Online Discussions, Surveys and Online Chats), probably because instructors used them only minimally during the pilot term.

Lecture Notes in *CourseInfo* took a variety of forms, including basic lecture outlines, detailed instructor notes, and PowerPoint slides. Students listed these as a major asset to their learning. The majority of students responding to this question indicated that notes enabled them to better organize information before class, allowing them to spend more time listening to the lecture. Students also reported that the notes helped them clarify and organize the information they received in class. Many students reported using the lecture notes for study and review of class information and preparing for exams (See Table 4, page *).

As expected, students felt that Quizzes and Practice Exams helped them to prepare for their in-class supervised exams and focus their study efforts (see Table 5 page *). Although these responses may reflect the availability of quizzes and practice exams, per se, and not the accessibility of them through *CourseInfo*, the features of immediate scoring and feedback through *CourseInfo* were clearly valuable to students.

Predictably, students commented that Course Announcements were helpful for keeping them informed of course-related events, such as assignment due dates, information about up-coming tests, and any changes in the course procedures. Course Announcements was the most highly used component in *CourseInfo* (reported by faculty as used "extensively"), perhaps due to the ease of application by course instructors. Also, students unable to attend classes noted that Course Announcements helped them to keep informed (see Table 6, page *).

Students responded positively concerning the ease of access to assignments through *CourseInfo* (see Table 7 page *). The instructional value of the practice gained from these assignments rated high as well, with students commenting that they had a better understanding of what was happening in class by completing these assignments. As with Quizzes and Practice Exams, it should be noted that the students' responses could be addressing the assignments, and not necessarily the added value of accessing them online. Many students explicitly commented on the usefulness of having these assignments online, however, as this procedure helped them to stay informed of due dates and follow a schedule for preparing and submitting assignments.

Nearly two-thirds of the students commented on the ease of access that *CourseInfo* provided to additional and helpful information through External Links (see Table 8, page *). About one-third of students responding to this question specifically described that these links were helpful in completing homework and assignments.

Students were positive in their responses about e-mail communication (see Table 9 page *). Over two-thirds of the students responded that e-mail through *CourseInfo* enabled them to communicate more easily with their instructors--asking questions and conversing about the course. Almost 20% commented that the ease of communication through e-mail was helpful, while others reported that it helped in contacting other students and to keep informed.

During the pilot term, instructors did not significantly use the Online Discussion, Group Work, Surveys, or Online Chat components of *CourseInfo*. Several instructors reported using these components only "minimally" and, therefore, these data will not be reported.

Comparison of Courses

Students were asked to compare the course they were currently taking, using *CourseInfo*, with other courses not using *CourseInfo*. In this comparison, students responded (either agreeing or disagreeing) that with *CourseInfo* they were more likely to perform 13 different instructionally-related activities. Of those students for whom these questions were applicable, Table 10 presents these data. The degree to which students reported using these activities varied from the highest rating of over 87% ("refer to course syllabus material") to a low of 58% ("work on assignments with other students.")

The two highest ratings were related to the access of online materials. Over 87% responded that they were more likely to "refer to course syllabus material," and 85% agreed that they were more likely to "access other online materials related to the content of this course" when compared with other courses not using *CourseInfo*. The next highest ratings related more to instructional activities and indicated that with *CourseInfo*, students were more likely to "review lecture notes to gain clarification," (85%), "complete assignments on time" (nearly 81%), "seek clarification when I did not understand something" (77%), and "actively participate in the course" (76%).

Other preferred activities included receiving feedback on quizzes and exams quickly, communicating with the instructor, spending more time studying for the course, discussing ideas from this course with other students, discussing ideas from this course with the instructor, and working on assignments with other students

Finally, students were also asked to agree or disagree with several statements as to the impact that certain online enhancements had on their learning. The highest positive response rate was to having *CourseInfo* used in other courses with over 90% agreeing. Almost 86% of the students agreed that online quizzes were helpful to their learning, and 81% agreed that the online environment contributed to their learning in the course (see Table 11, page *).

Lessons Learned

This section summarizes some of the lessons learned from the evaluations and experiences gained during the pilot and subsequent terms. The lessons are gleaned from an analysis of the formal formative and summative evaluation measures, Web server statistics, help desk reports, and anecdotal data collected from students, faculty, and support staff.

First, using online enhancements increased the time that students were involved in learning tasks, such as accessing other online materials related to the content of the course, reviewing lecture notes to gain clarification, and completing assignments on time. Time on-task is one factor that has been found to contribute to increased student learning. Both students and faculty also valued the ability to use quizzes and practice exams, with immediate scoring and feedback. This was especially important in high enrollment courses where logistics and scoring time can be barriers to their use.

Students reported that they liked online materials and that the online environment contributed to their learning. Students clearly want these enhancements in their courses. Providing outlines of lecture notes prior to a class allows students to organize information before class and spend more time listening in class. Students reported that procedures as simple as providing lecture outlines have a major positive impact on their learning. It should be noted that few faculty reported any decrease in attendance as a result of using *CourseInfo*.

During this pilot term, most instructors used more content-delivery components of *CourseInfo* (e.g., Course Announcements, Lecture Notes, and Course Assignments) than the interactive components (e.g., online discussions, chats, and group work), possibly because the former required less additional instructional design and development effort. However, as observed during terms subsequent to the pilot, faculty tend to develop online enhancements to their courses in stages, beginning with providing course materials online, then developing more interactive components, such as discussion and online quizzes. It is important to assist faculty to recognize the value of increasing the use of interactive components. As faculty become more familiar with these benefits, they may be more likely to design them into their courses. A recommendation for further study is to identify what changes, if any, are occurring with in-class teaching when online components are used.

On the basis of the pilot and subsequent terms, the key ingredients of the success of the project include the ability to engage faculty, provide training and support, and plan and coordinate the project activities.

Engage Faculty

- Advice and consent: Involving faculty in the selection process for course management software is crucial. Moreover, collaborating on a campus-wide basis (Provost, Deans, Department Chairs, and support units) is an effective model. Few individual academic units have sufficient instructional and technical resources to effectively address all the needs and support for a project of this scope. The pilot program should be part of a broad-based strategic effort.
- Motivated faculty: It is important to include motivated faculty in this type of pilot project. Those who are interested in using online materials will be more likely to create richer and more effective online materials, assist their colleagues in developing them, and be more tolerant of technology limitations and failures. Generally, they will become better role models for other faculty. For this reason, it is also important to seek and engage faculty influence leaders beginning in the early days of the project.

Provide Training and Support

- Require training: To use it effectively, faculty members need to learn the capabilities and idiosyncrasies of course management software. Faculty training should address course design concepts and introduce faculty to the software package and its local operational and support procedures. Requiring training will place less stress on support services in the future. At the University of Pittsburgh, a one-day core training module has been a required prerequisite for using *CourseInfo* for its four terms of use (over one year). In addition to training, on-going faculty support is critical to success, both in instructional design and in the use of technology.
- Focus on instructional design: Include and emphasize instructional design in any training program. Faculty who work through the thinking/planning process of incorporating online enhancements into their on-campus courses use the components of *CourseInfo* to their fullest. Keep the emphasis in training on the functionality and instructional purpose of the technology, using the technology as a

tool and not as an end.

· Adapt support services: Analyzing, reengineering, and implementing effective faculty and student support services is a critical success factor for Web-enabled instruction. These include services such as operating a 24-hour help desk, ensuring adequate remote access, providing standard browser and plug-in software in public student labs, providing in-class student orientations to the software, and supporting in-class A/V presentations.

Plan and Coordinate

· Senior-level support: Because this project cut across multiple academic and service units, strong senior-level support was crucial to acquiring and implementing the tools and resources necessary to optimize the success of the project.

· Communicate and coordinate: Involve related academic and technical support units and their key staff in planning and coordination activities, facilitated by group work technologies such as list servers, shared Web pages, and audio and video conferencing.

· Follow-up: Plan and implement opportunities to discuss online instructional management systems among faculty who have used (and those who will be using) these tools with their courses. At Pitt, based on a recommendation from the Summer Instructional Development Institute faculty, a "Teaching with Technology Series" was successfully implemented. In the year following the pilot term, four faculty-led workshops were offered on topics such as "Creating a Web-based Lecture," "Internet-based Assignments that Work," and "Workable Online Discussions."

· Evaluate: It is important to develop formative and summative evaluation plans and procedures for this type of technology-related course initiative. Although evaluation is generally included as part of any pilot program, it is necessary to design and carry out on-going assessment procedures. Such procedures help to gain insight into the best practices that faculty should be encouraged to use based on student need.

Conclusion

In summary, the pilot and subsequent terms demonstrate that, given a well-supported tool that enables them to use the Web for on-campus course enhancement, without requiring extensive technical knowledge, faculty will respond positively by implementing the tool, as illustrated by the dramatic growth in the use of *CourseInfo* at Pitt (See Table 1).

Tables

The following table is based on an analysis of hits (Web page visits) taken from the Web server log file generated by the production server for the Fall Term, 1998.

Table 1: *CourseInfo* Growth by Term

	Fall 98	Spring 99	Summer 99	Fall 99
Sections	22	115	107	350
Seats	1,850	4,500	2,000	13,450

Table 2: Means of Access to CourseInfo

Location	Hits	Percentage
Residence Halls	327,861	19%
Computing Labs	543,643	31%
Regional Campuses	132,171	8%
Other Pitt	175,945	10%
Dial Up to Pitt	203,921	12%
ISP (e.g., AOL, MSN)	343,190	20%
Total	1,726,731	100%

Table 3: CourseInfo Components Rated as "Helpful" (796 Responses)

Component	Responses	Percentage
Lecture Notes	521	66.6%
Quizzes/Practice Exams	331	41.5%
Course Announcements	326	41.0%
Assignments	226	28.4%
External Links	212	26.6%
E-mail	180	22.6%

Table 4: Lecture Notes (475 Written Comments)

45.9%	Helped me to prepare for class—I printed notes before class and was able to listen more to the lecture; added organization to the lecture.
24.4%	Helped clarify class information—something I did not understand in class; helped me to organize my notes
15.6%	Helped with studying and reviewing for exams
14.1%	If I missed a lecture, I could get the basic information

Table 5: Quizzes/Practice Exams (310 Written Comments)

83.9%	Helped to prepare for exams and focus my studying efforts
14.5%	Practice was useful
1.6%	Useful for grade posting

Table 6: Course Announcements (268 Written Comments)

89.6%	Helped me to keep informed of course-related events
10.4%	If I was unable to attend a class, this helped me to stay informed

Table 7: Assignments (169 Written Comments)

49.7%	Ease of access to assignments
27.2%	With the practice gained from assignments, I had better understanding.
23.1%	Easily stay informed of what was due; could follow a schedule

Table 8: External Links (191 Written Comments)

63.6%	Provided easy access to external information; provided more and helpful information
33.0%	Provided help with homework and assignments
3.4%	Provided help with research

Table 9: E-mail Communication (144 Written Comments)

67.4%	Ease of contact with instructors and to ask questions
18.1%	Ease of communication
9.7%	Helped to keep informed
4.9%	Helped to contact other students

Table 10: Preference for *CourseInfo* vs. *Non-CourseInfo* Courses

Activity	Students Agreeing
Refer to course syllabus.	87.2%
Access other online materials related to the content of this course.	85.4%
Review lecture notes to gain clarification.	85.1%
Complete assignments on time.	80.8%
Actively participate in the course.	77.4%
Seek clarification when I did not understand something.	76.2%
Receive instructor comments on assignments quickly.	75.5%
Receive feedback on quizzes and exams quickly.	73.9%
Communicate with my instructor.	70.8%
Spend more time studying for the course.	67.4%
Discuss ideas from this course with other students.	62.0%
Discuss ideas from this course with the instructor.	59.8%
Work on assignments with other students.	57.7%

Note: In the above table, the "Agree" and "Strongly Agree" responses were combined, the "Disagree" and "Strongly Disagree" responses were combined, and the "Not Appropriate" responses were not counted.

Table 11: Impact of Online Learning Components

Statement	Students Agreeing
I would like to have <i>CourseInfo</i> used in other courses.	90.2%
Online quizzes were helpful to my learning.	85.9%
The online environment contributed to my learning in the course.	81.4%
Online discussions encouraged me to think more about the course concepts than I usually do.	53.8%

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Title: Assessing the Impact on Students of Online Materials in University Courses

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Year: 1999

Abstract: Many universities currently encourage the use of online materials to enhance on-campus courses. Assessment of the impact of these technology-enhanced course initiatives is necessary if we are to gain insight into the best practices_ those that faculty should be encouraged to use based on student need. Assessment studies of this type will enrich the literature of distributed learning in higher education. This paper will present and discuss 1) a process for designing assessment strategies to measure the impact of online course materials on students and 2) the results of formative and summative evaluation, including the categories of benefits reported by students. Based on a campus-wide initiative to train university faculty to use course management software, this assessment includes data collected during a pilot-term with over 1850 students enrolled in 20 courses (22 sections).

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